

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
18 August 2005 (18.08.2005)

PCT

(10) International Publication Number  
**WO 2005/076246 A1**

(51) International Patent Classification<sup>7</sup>: **G09F 9/37,**  
B81B 3/00, 7/04, G02B 26/02

(NL). DE WITZ, Christiane, M., R. [BE/BE]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL). MOL, Grietje, N. [NL/NL]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).

(21) International Application Number:  
**PCT/IB2005/050352**

(74) Agents: TOL, Arle, J., W. et al.; Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).

(22) International Filing Date: 27 January 2005 (27.01.2005)

(81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(25) Filing Language: English

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH,

(26) Publication Language: English

[Continued on next page]

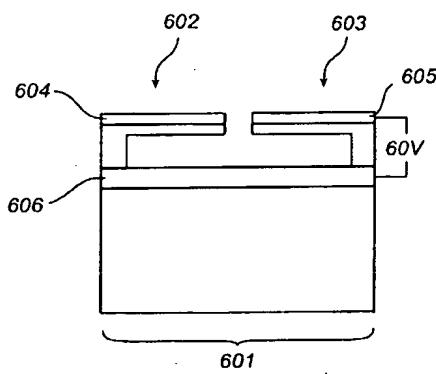
(30) Priority Data:  
04100398.9 4 February 2004 (04.02.2004) EP

(71) Applicant (*for all designated States except US*): KONINKLIJKE PHILIPS ELECTRONICS N.V. [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).

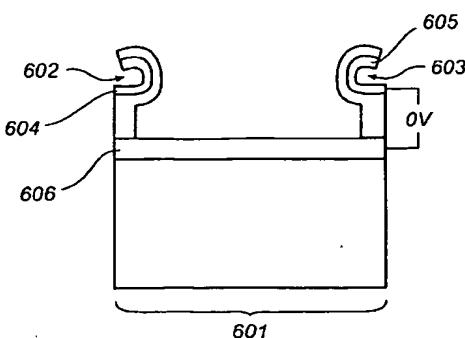
(72) Inventors; and

(75) Inventors/Applicants (*for US only*): BROER, Dirk, J. [NL/NL]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven

(54) Title: MECHANICAL SHUTTER WITH POLYMERISED LIQUID CRYSTAL LAYER



(57) Abstract: The present invention relates to a mechanical shutter (601) that comprises a shutter element having a layer of polymerized liquid crystal. The polymerized liquid crystal is anisotropically oriented. At one major surface the orientation is anisotropic. In moving towards the opposite major surface the orientation varies, the variation being such that the thermal expansion coefficient varies in moving from the major surface to the opposite surface. When exposed to non-mechanical means such as heat, the shutter element moves. When for example a splayed or a twisted nematic orientation is used, the element bends and straightens in response to the non-mechanical means. Electrodes (604, 605, 606) can optionally be formed on the element and on a supporting substrate, rendering the element controllable by an electric field applied between the electrodes due to resulting electrostatic forces. The invention furthermore provides a method of manufacturing such mechanical shutters using in-situ polymerization.



WO 2005/076246 A1



GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Declaration under Rule 4.17:**

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY,*

*TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)*

**Published:**

- *with international search report*

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*